

## CLAIMS

What is claimed is:

1. An apparatus comprising:  
a conveyor system conveying eggs along an egg flowpath; and  
means along the flowpath for preferentially exciting a TE-like mode of the eggs and  
separately preferentially exciting a TM-like mode of the eggs.
2. The apparatus of claim 1 wherein the means comprises:  
first means for preferentially exciting a  $TM_{101}$ -like mode of the eggs; and  
second means for preferentially exciting a  $TE_{101}$ -like mode of the eggs.
3. The apparatus of claim 2 wherein the first means comprises:  
a main waveguide in which a TM mode is principally preferentially excited; and  
inlet and outlet waveguides.
4. The apparatus of claim 1 wherein:  
the conveyor is configured to spin the eggs during said preferential exciting of the  
 $TE_{101}$  and  $TM_{101}$  modes of the eggs.
5. An apparatus comprising:  
a conveyor system conveying eggs along an egg flowpath;  
a first waveguide along the flowpath for preferentially exciting the  $TM_{101}$ -like mode  
of the eggs; and  
a second waveguide along the flowpath for preferentially exciting the  $TE_{101}$ -like mode  
of the eggs.
6. The apparatus of claim 5 wherein:  
the first waveguide is a pillbox cavity;  
the second waveguide is a shielded pair cavity.
7. An apparatus comprising:  
a conveyor system conveying eggs along an egg flowpath; and  
an essentially right circular cylindrical microwave cavity along the flowpath oscillated  
at a power and frequency for microwave heating of the yolks of the eggs to temperatures

above temperatures of albumen of the eggs.

8. The apparatus of claim 7 wherein:  
the cavity is positioned longitudinally along the flowpath; and  
the cavity has a length which is less than a diameter.
9. The apparatus of claim 7 wherein:  
the cavity is positioned longitudinally along the flowpath; and  
the cavity has a first and second endwalls with respective first and second central apertures; and  
inlet and outlet waveguides below cutoff for said frequency are positioned along the flowpaths to pass the eggs respectively into and out of the cavity through said first and second apertures.
10. The apparatus of claim 7 further comprising at least one of:  
a second microwave cavity along the flowpath oscillated at a power and frequency for microwave heating of one or both of the yolks and the albumen of the eggs;  
a cryogenic chiller positioned along the flowpath and operated to preferentially cool the albumen of the eggs;  
a thermal conduction heater positioned along the flowpath.
11. The apparatus of claim 7 further comprising:  
a second essentially right circular cylindrical microwave cavity along the flowpath oscillated at a power and frequency for microwave heating of the yolks of the eggs to temperatures above temperatures of albumen of the eggs;
12. An apparatus comprising:  
a conveyor system conveying eggs along an egg flowpath; and  
means along the flowpath for microwave heating of the yolks of the eggs to temperatures above temperatures of albumen of the eggs.
13. The apparatus of claim 12 wherein the means comprises:  
first means for precooling the albumen to precool temperatures below precool temperatures of the yolks; and

microwave heating means for said microwave heating of at least said yolks.

14. The apparatus of claim 13 wherein the microwave heating means is configured to heat the yolks and the albumen.

15. A method for using the apparatus of claim 12 wherein, for each of the eggs, the means is used to:

first preferentially precool the albumen; and

then effect the microwave heating of the yolk and of the preferentially precooled albumen.

16. The method of claim 15 wherein:

the preferential precooling is sufficient to produce a 2 log kill of salmonella in the albumen.

17. A method for the in-shell pasteurization of eggs comprising:

directing a flow of eggs along a flowpath through a pasteurization apparatus;

a first step performed via the apparatus for preferentially microwave heating yolks of the eggs; and

a second step performed via the apparatus for preferentially microwave heating albumen of the eggs.

18. The method of claim 17 wherein:

combined effects of the first and second steps are effective to achieve at least a five log reduction in salmonella bacteria in at least one of the yolk and albumen.

19. The method of claim 17 further comprising:

rotating the eggs during the first and second steps.

20. The method of claim 17 wherein:

a major portion of the albumen reaches a first peak temperatures in the range of 125°-134°F; and

a major portion of the yolk reaches a second peak temperatures in above 140°F.

21. The method of claim 17 further comprising:  
measuring masses of the yolk and albumen of the eggs;  
adjusting parameters of one or both of the first and second steps responsive to the measuring.
22. The method of claim 17 performed essentially in the absence of coagulation of the albumen and yolk.
23. A method for the in-shell pasteurization of eggs comprising:  
directing a flow of eggs through a pasteurization apparatus;  
preferentially exciting a  $TM_{101}$ -like mode of the eggs; and  
preferentially exciting a  $TE_{101}$ -like mode of the eggs.
24. The method of claim 23 wherein:  
the  $TM_{101}$ -like mode of the eggs is preferentially excited before the  $TE_{101}$ -like mode of the eggs is preferentially excited, for each of the eggs.